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August 1, 2008

To: Environmental Protection Agency
Contracts Management Division
26 West Martin Luther King Drive
Cincinnati, OH 45268

Attention: Tammy A. Thomas
Contracting Officer

Subject: Work Plan for Work Assignment 1-08, EPA Contract EP-C-07-028, under SwRI Project 14175.08, SwRI Proposal No. 08-53372.

Contract Title: "Broad Testing Support for In-Use Engines and Vehicles"

Assignment Title: "Fuel Parameter Influence on Vehicle Emissions for EPAct Testing"

1.0 OVERVIEW

The Energy Policy Act of 2005 requires that EPA produce an updated fuel effects model representing the 2007 light-duty gasoline fleet. The fuel matrices which are the subjects of this Statement of Work will be utilized in a vehicle test program that will generate the exhaust emission data needed to develop that model. Statistical design of the experimental methodology will be used to select the target values for these fuel matrices.

2.0 SCOPE OF WORK

The Test Plan for this Work Assignment (WA) follows the Statement of Work given in Appendix A. Southwest Research Institute7 (SwRI) will generate several statistical test fuel matrix designs optimized for various ethanol blends and other fuel properties in compliance with the directions provided by EPA. In addition to designing the test fuel matrices, SwRI also will provide appropriate statistics regarding the efficiency of the generated designs.

3.0 TASK 1: WORK PLAN DEVELOPMENT

SwRI staff will submit a work plan for EPA approval within 15 calendar days after receipt of this WA. The work plan will include a description of how the tasks will be performed.

4.0 TASK 2: QUALITY-ASSURANCE PROJECT PLAN (QAPP)

SwRI plans to use standard statistical methods in this project so no formal QAPP is required. The statistical tools to be used and how they are to be used to produce the deliverables in Task 4 are described in Section 5.0.

5.0 TASK 3: GENERATING FUEL MATRICES

SwRI will use five gasoline fuel properties, as specified by EPA, along with numeric ranges (levels) for them and generate fuel matrices that are statistically optimized to resolve differences between the five parameters as to their effect on vehicle exhaust emissions. This will be done by

(1) specifying a set of candidate fuels based on a full factorial design and any fuel property restrictions or limitations,

(2) specifying a linear regression model based on the five fuel properties and including designated two-way interactions and quadratic effects, and

(3) choosing the design points so that the coefficients of the fuel properties in the model can be estimated as efficiently as possible.

An experimental design software package, ECHIP Version 7.01, will be used to computer generate the design matrices to meet the above conditions. The generated designs will be based on an algorithmic design procedure which optimizes the G-efficiency. G-efficiency is a measure of the goodness of the design and is defined as the ratio of the maximum variance of an optimal design to the maximum variance of a given design.

The five fuel properties will include Reid Vapor Pressure (RVP), Distillation Temperature at 50 Percent Evaporated (T50), Distillation Temperature at 90 Percent Evaporated (T90), Fuel Volume Percent Aromatics, and Volume Percent Ethanol. The design matrices will be developed from the five fuel properties at 2 levels for RVP, 5 levels for T50, 2 levels for T90, 2 levels for volume percent aromatics, 4 levels for ethanol. An **exception** was made to increase the levels for T50 from the 4 levels listed in the Work Statement to 5 levels after clarifying this with the Work Assignment Manager. It is assumed that the targets for the various levels will be provided by the Work Assignment Manager via written direction.

6.0 REPORTING AND DELIVERABLES

The Work Assignment indicates that the fuel matrix designs and associated statistics must be delivered, as needed, on or before August 1, 2008. An **exception** will be made to this requirement and the due date for this deliverable will be extended to September 26, 2008. This is being done at the request of the Work Assignment Manager, Dr. Rafal Sobotowski.

The format for the designed fuel matrices will be in Microsoft Excel format. An **exception** will be made to the format of the statistics. Since the only statistic to be generated is the G-efficiency for each design, the statistic will be printed in the Excel files with the designs. As indicated in the Statement of Work, no formal written report will be prepared.

7.0 STAFF ASSIGNMENTS

The Project Manager will be Dr. Robert L. Mason, who will also act as Principal Investigator. Ms. Janet P. Buckingham will assist in developing the statistical test matrices. Dr. Mason and Ms. Buckingham are staff members within the Fuels and Lubricants Research Division (Division 08).

8.0 PROJECTED LABOR HOURS AND OTHER DIRECT COSTS

Based on our understanding of Work Assignment 1-08, we project the breakdown of employee utilization by labor category as detailed in Table 1. Complete cost detail is presented in the attached cost breakdown given in Attachment B.

TABLE 1. PROJECTED LABOR HOURS FOR WORK ASSIGNMENT 1-08

Labor Category	Hours
PL4	Ex. 4 - CBI
PL3	
Total Technical Hours	

9.0 SUMMARY

Southwest Research Institute has responded to Work Assignment 1-08 with the three exceptions as noted in Sections 5.0 and 6.0 above. Should any questions of a technical nature arise, please contact Dr. Robert L. Mason at 210-522-2671. If there are questions regarding cost or contractual issues, please contact Ms. Sherry Twilligear at 210-522-3948. Thank you for this opportunity to be of service.

Prepared by:

Robert L. Mason

Robert L. Mason
Institute Analyst
Fuels and Lubricants Research Division

Approved by:

Walter P. Groff, Jr.
Senior Vice President
Office of Automotive Engineering

cc: Sherry Twilligear, SwRI Contracts

ATTACHMENT A

WORK ASSIGNMENT 1-08

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 1-08

[X] Original [ ] Amendment Number:

Contract Number: EP-C-07-028

Contract Period: Option Period Number: 1

Title of Work Assignment: "Fuel Parameter Influences on Vehicle Emissions for EPAct Tesing"

Contractor: Southwest Research Institute

Specify Section and Paragraph of Contract SOW:
Task 1 of the Performance Work Statement

Purpose: [X] Work Assignment Initiation [] Work Assignment Close-Out
[] Work Assignment Amendment [] Incremental Funding
[] Work Plan Approval

Periods of Performance
From: Effective Date To: 09/30/2008

Comments: Fuel Modeling for EPact Testing

[] Superfund | **Accounting and Appropriations Data** | [] Non-Superfund

Line	DC (Max 8)	Budget/FYs (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount	(Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1											
2											
3											
4											
5											

Authorized Work Assignment Ceiling

Contract Period: 1	Cost/Fee	LOE hours (Professional)
This Action		Ex. 4 - CBI
Total		

Work Plan / Cost Estimate Approvals

Contractor WP Dated :	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Rafal Sobotowski
(Signature) Rafal A. Sobotowski (Date) 7/23/08
Branch/Mail Code ASD, S-89
Phone Number 734/214-4828
Fax Number 734/214-4816

Project Officer Name Carl Scarbro
(Signature) (Date) 7/22/08
Branch/Mail Code ASD S-87
Phone Number 734/214-4209
Fax Number 734/214-4939

Other Agency Official Name _____
(Signature) (Date) 1/23/08
Branch/Mail Code
Phone Number
Fax Number

Contracting Official Name: TAMMY A. THOMAS
(Signature) J. Thomas (Date) 7/28/08
Branch/Mail Code CPOD
Phone Number 513-487-2030
Fax Number 513/487-2109

Contractor Acknowledgement of Receipt and Approval of Workplan *(Signature and Title)* | Date

EPA Form 1900-69 (Rev. 07-95)

[redacted]

Performance Work Statement

Contract EP-C-07-028	Work Assignment Number 1-08
Issuing Office	Environmental Protection Agency 2000 Traverwood Drive Ann Arbor, MI 48105-2498
Contractor	Southwest Research Institute 6220 Culebra Rd. San Antonio, TX 78228-0510
Title	Fuel Parameter Influences on Vehicle Emissions for EPAct Testing

Background

Section 1506 of the Energy Policy Act of 2005 (Energy Act) requires EPA to produce an updated fuel effects model representing the 2007 light duty gasoline fleet, including determination of the emissions impacts of increased renewable fuel use.

The use of ethanol in gasoline has increased more than five-fold since 2000, and it is likely that its use will continue to expand into the next decade. It is also likely that use of ethanol blends at 10% or greater will expand significantly.

Recent investigation related to the Mobile Source Air Toxics (MSAT2) rulemaking has shown that hydrocarbon emissions from light duty gasoline vehicles increase significantly as test temperature is decreased. As a result, the MSAT2 rulemaking promulgated Non-Methane Hydrocarbon (NMHC) standards at 20°F. However, this being a relatively new area of study, fuel effects data at temperatures lower than 75°F is scarce for use in emissions models.

Hydrocarbon (HC) emissions are composed of hundreds of compounds, some of which have been identified by the EPA as air toxics. The Clean Air Act directs EPA to set standards to reduce air toxics emissions. Most existing data on the fractional relationship between the various air toxics and HC emissions has been established using vehicles meeting Tier 0 emissions standards (now more than 10 years old), and burning fuels that did not contain ethanol.

Scope and Objectives

The tasks to be preformed under this Performance Work Statement (PWS) are further specified as follows: Perform statistical redesign of the test fuel matrices optimized for 20% ethanol blends, which could be used in EPAct Program to investigate the effect of five gasoline parameters on vehicle exhaust emissions.

Task 1 Work Plan Development

The contractor shall submit a work plan for EPA approval within 15 calendar days after receipt of this WA. The work plan shall include a description of how the tasks described below are to be performed.

Task 2 Quality-Assurance Project Plan (QAPP)

If the contractor uses standard statistical methods then no formal QAPP is required, however, the contractor shall indicate, in the work plan, what statistical tools are to be used and how they are to be used to produce the deliverables in Task 4. If standard statistical methods are not used, the contractor shall notify the Work Assignment Manager (WAM) immediately.

Task 3 Generating Fuel Matrices

The contractor shall take 5 gasoline fuel parameters along with numeric ranges (levels) for them and generate fuel matrices that are statistically optimized to resolve differences between the five parameters as to their effect on vehicle exhaust emissions. In addition to the design the contractor shall provide appropriate statistics concerning the 'efficiencies' of the various designs to predict the effect of the 5 parameters on vehicle emissions.

The 5 parameters are Reid Vapor Pressure (RVP), Distillation Temperature at 50 Percent Evaporated (T50), Distillation Temperature at 90 Percent Evaporated (T90), Fuel Volume Percent Aromatics, and Volume Percent Ethanol. The matrices will be developed from the five parameters at 2 levels for RVP, 4 levels for T50, 2 levels for T90, 2 levels for volume percent aromatics, and 4 levels for volume percent ethanol. The targets for the various levels will be provided to the contractor by the Work Assignment Manager via written technical direction.

Task 4 Reporting and Deliverables

Fuel matrix designs and associated statistics shall be delivered on or before August 1, 2008. The format for the matrix shall be in Microsoft Excel and the statistics in a common text file format that the contractor has on hand. No formal written report is required.

Work Assignment Manager (WAM)	Rafal Sobotowski, 734/ 214-4228
Alternate WAM	Constance Hart, ASD 734/214-4340

ATTACHMENT B

COST PROPOSAL FOR WORK ASSIGNMENT 1-08

Ex. 4 - CBI

Ex. 4 - CBI

Ex. 4 - CBI

Ex. 4 - CBI

Ex. 4 - CBI

Ex. 4 - CBI